



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICS P3**

**FEBRUARY/MARCH 2011**

**POSSIBLE ANSWERS**

**MARKS: 100**

**This memorandum consists of 11 pages.**

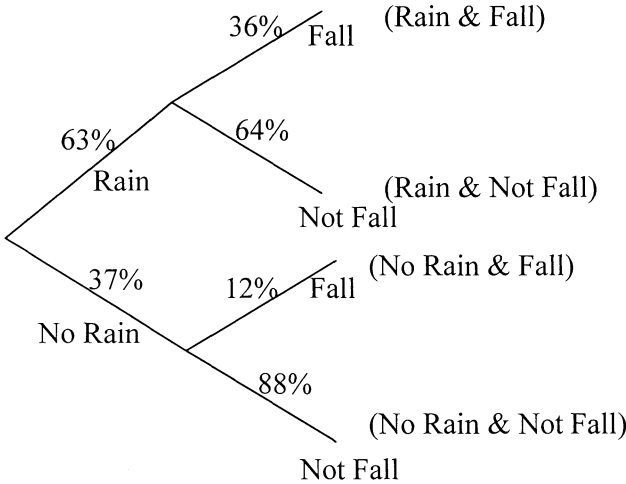
**QUESTION 1**

1.1	Mean $= \frac{3,2 + 3,2 + 3,2 + 4,2 + 4,5 + 4,9 + 8,3 + 9,5 + 11,7 + 12,2 + 12,5}{11}$ $= \frac{77,4}{11}$ $= 7,03$ Median = 4,9 Mode = 2,3	✓ Mean ✓ Median ✓ Mode (3)
1.2	Mode This is the lowest value and will indicate that the increases are very poor.	✓ mode ✓ reason (2)
1.3	Mean. This is the highest value and can be used to indicate that increases are good.	✓ Mean ✓ Reason (2) [7]

**QUESTION 2**

2.1	$\sigma = \frac{90 - 65}{2}$ $\sigma = 12,5$	✓ method ✓ answer (2)
2.2	University A: $78 - 65 = 13$ Her result lies just over 1 standard deviation from the mean.  University B: $\bar{x} + \sigma = 54$ $\bar{x} + 2\sigma = 59$ Her result lies just over 2 standard deviations from the mean.  Her result for University B is better.	✓ 1 sd from the mean  ✓ 2 sd from the mean ✓ University B. (3) [5]

**QUESTION 3**

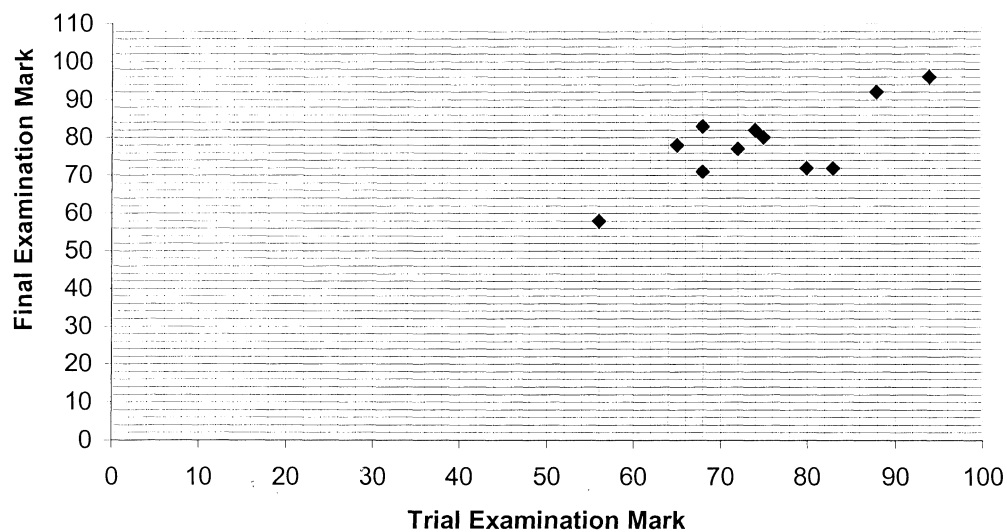
3.1		✓✓ structure of the tree diagram  ✓ 63% Rain ✓ 36% Fall  ✓ 64% Not fall  ✓ 88% Not Fall (6)
3.2	$  \begin{aligned}  P(\text{Not Fall}) &= \left( \frac{37}{100} \times \frac{88}{100} \right) + \left( \frac{63}{100} \times \frac{64}{100} \right) \\  &= \frac{407}{1250} + \frac{252}{625} \\  &= \frac{911}{1250} \\  &= 0,7288  \end{aligned}  $	✓ $\frac{37}{100} \times \frac{88}{100}$ ✓ $\frac{63}{100} \times \frac{64}{100}$ ✓ answer (3)
3.3	$  \begin{aligned}  P(\text{Dry \& Fall}) &= \frac{37}{100} \times \frac{12}{100} \\  &= \frac{111}{2500} \\  &= 0,0444  \end{aligned}  $	✓ $\frac{37}{100} \times \frac{12}{100}$ ✓ answer (2) <b>[11]</b>

## QUESTION 4

Average of trial examination	80	68	94	72	74	83	56	68	65	75	88
Final examination mark	72	71	96	77	82	72	58	83	78	80	92

4.1

Scatter Plot showing the trial examination mark vs final examination mark



3 marks:  
All points  
plotted  
correctly.

2 marks:  
7 – 10  
points  
plotted  
correctly

1 mark:  
3 – 6  
points  
plotted  
correctly

(3)

4.2

$$a = 25,38 \quad (25,38342009\dots)$$

$$b = 0,71 \quad (0,7069044703\dots)$$

$$\hat{y} = a + bx$$

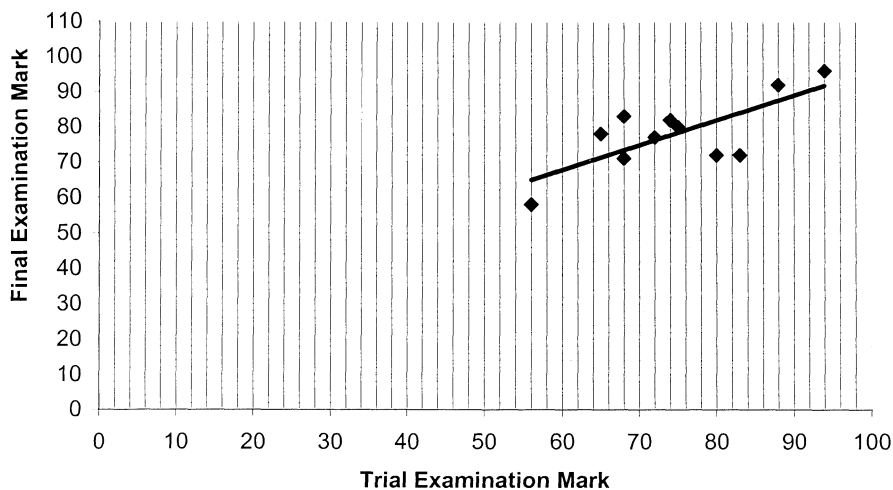
$$\hat{y} = 25,38 + 0,71x$$

✓✓  $a$   
✓  $b$

✓ answer  
(4)

4.3

Scatter plot showing the trial examination mark vs final examination mark



✓ slope  
✓ accurate  
drawing  
(2)

4.4	$r = 0,74$ (0, 7391817008...)	✓✓ answer (2)
4.5	$\hat{y} = 25,38 + 0,71x$ $\hat{y} = 25,38 + 0,71(75)$ $= 78,63 \%$  If the original values of $a$ and $b$ then $\hat{y} = 78,401$	✓ substitution ✓ answer (2) <b>[13]</b>

**QUESTION 5**

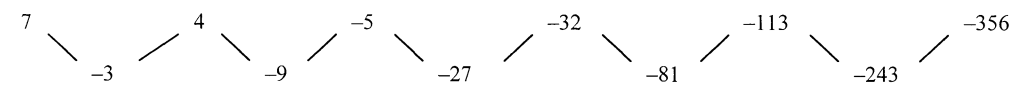
	Broken a limb	Not broken a limb	TOTAL
Male	463	$b$	782
Female	$a$	$c$	$d$
TOTAL	913	617	1 530

5.1	$a = 450$ $b = 319$ $c = 298$ $d = 748$	✓ answer for $a$ ✓ answer for $b$ ✓ answer for $c$ ✓ answer for $d$ (4)
5.2	P(Female who has not broken a limb) $= \frac{298}{1530}$ $= \frac{149}{765}$	✓ 298  ✓ answer (2)
5.3	P(Female & broken a limb) $= \frac{450}{1530}$ $= \frac{5}{17}$ $= 0,2941176471...$ $= 0,29$ P(Female) $\times$ P(Broken a limb) $= \frac{748}{1530} \times \frac{913}{1530}$ $= 0,29$ The events of being female and having broken a limb are independent.  If a candidate answers not independent due to the fact that the answers are not accurate to more than 2 decimal places, award full marks.	✓ $\frac{463}{1530}$  ✓✓ $\frac{782}{1530} \times \frac{913}{1530}$ ✓ independent (4) <b>[10]</b>

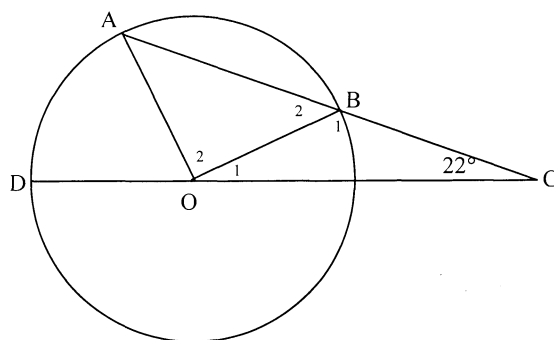
## QUESTION 6

6.1	Number of different ways the shirts and trousers can be arranged $= (7 + 4)!$ $= 11!$ $= 39\,916\,800$	✓ 11 ✓ 11! (2)
6.2	Number of ways so that the shirts are together and trousers are together $= 7! \cdot 4! \cdot 2$ $= 241\,920$	✓ 7! ✓ 4! ✓ $\times 2$ (3)
6.3	P(Shirt at beginning and trouser at the end) $= \frac{9! \times 4 \times 7}{11!}$ $= \frac{14}{55}$	✓ $\times 4 \times 7$ ✓ 9! ✓ 11! ✓ answer (4) [9]

## QUESTION 7

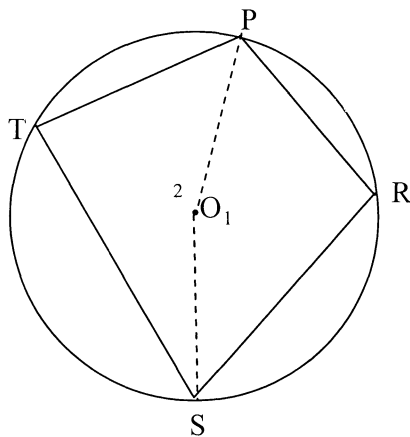
7.1	 $-113; -356$	✓✓ answers (2)
7.2	$T_{k+1} = T_k - (3)^k$ $T_1 = 7$ $k \geq 1$ <b>OR</b> $T_{k+1} = T_k - 3(3)^{k-1}; \quad T_1 = 7; \quad k \geq 1$ <b>OR</b> $T_k = T_{k-1} - (3)^{k-1}; \quad T_1 = 7; \quad k \geq 2$	✓ $T_{k+1} = T_k - (3)^k$ ✓ $T_1 = 7$ ✓ $k \geq 1$ (3) [5]

## QUESTION 8

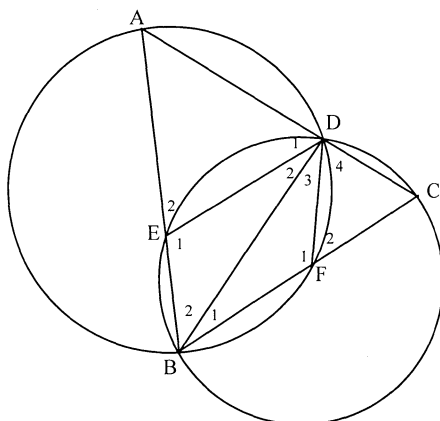


8.	$AO = OB$ (radii) $AO = BC$ (given) $OB = BC$ $\hat{O}_1 = 22^\circ$ ( $\angle$ s opp = radii) $\hat{B}_2 = 44^\circ$ (ext $\angle \Delta$ = sum int opp) $\hat{A} = 44^\circ$ ( $\angle$ s opp = radii) $\hat{AOD} = 66^\circ$ (ext $\angle \Delta$ = sum int opp)	$\checkmark$ S  $\checkmark$ S $\checkmark$ S/R $\checkmark$ S  $\checkmark$ S $\checkmark$ answer
[5]		

## QUESTION 9



9.1	Join PO and OS Let $\hat{O}_1 = 2x$ $\hat{T} = x$ ( $\angle$ at circ centre = 2 $\angle$ at circumference) $\hat{O}_2 = 360^\circ - 2x$ ( $\angle$ s round a point) $\hat{R} = 180^\circ - x$ ( $\angle$ at circ centre = 2 $\angle$ at circumference) $\hat{T} + \hat{R} = x + 180^\circ - x$ $= 180^\circ$	$\checkmark$ construction  $\checkmark$ S/R $\checkmark$ S $\checkmark$ S/R $\checkmark$ S
(5)		

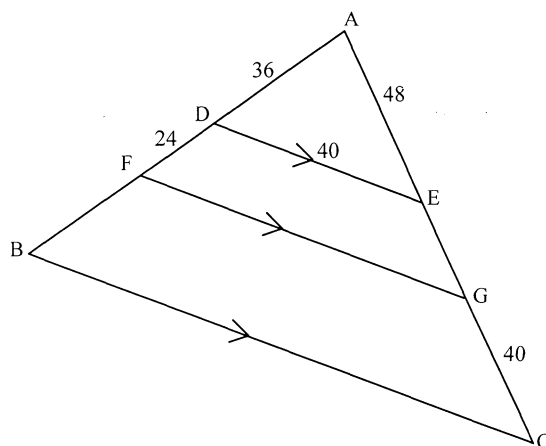


9.2.1(a)	$\hat{D}_4 = \hat{C}$ ( $\angle$ s opp = sides) $\hat{C} = x$ ( $\angle$ sum $\Delta$ ) $\hat{DEB} = 180^\circ - x$ (opp $\angle$ cyclic quad supp)	$\checkmark$ S/R $\checkmark$ S $\checkmark$ S/R (3)
9.2.1(b)	$\hat{A} = 180^\circ - 2x$ (ext $\angle$ cyclic quad = int opp $\angle$ )	$\checkmark$ S $\checkmark$ R (2)
9.2.2	$\hat{D}_1 + \hat{A} = \hat{E}_1$ (ext $\angle$ $\Delta$ = sum int opp) $\hat{D}_1 = x$ $\hat{C} = x$ ( $\angle$ sum $\Delta$ ) OR proved above $\hat{D}_1 = \hat{C} = x$ $DE \parallel CB$ (corres $\angle$ s =)	$\checkmark$ S/R  $\checkmark$ statement $\checkmark$ Reason (3)

**[13]**

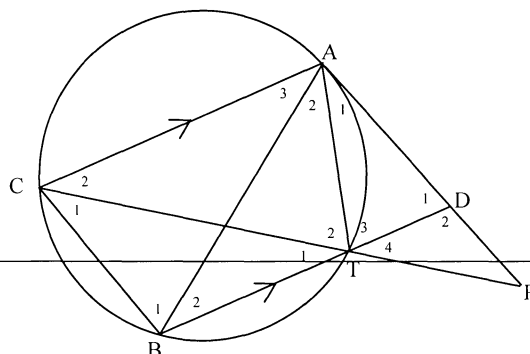


## QUESTION 10



10.1	$\frac{EG}{48} = \frac{24}{36} \quad (DE \parallel FG)$ $EG = \frac{48 \times 24}{36}$ $EG = 32 \text{ cm}$	✓ S/R  ✓ answer (2)
10.2	$\frac{BC}{DE} = \frac{AC}{AE}$ $BC = \frac{120 \times 40}{48}$ $= 100 \text{ cm}$ <p><b>OR</b></p> $\frac{AB}{AD} = \frac{AC}{AE}$ $AB = \frac{120 \times 36}{48}$ $AB = 90$ $\triangle ABC \parallel \triangle ADE \quad (\angle \angle \angle)$ $\frac{BC}{DE} = \frac{AB}{AD} \quad (\text{sides in proportion})$ $BC = \frac{90 \times 40}{36}$ $BC = 100 \text{ cm}$ <p><b>OR</b></p> $\triangle ABC \parallel \triangle ADE \quad (\angle \angle \angle)$ $\frac{BC}{DE} = \frac{AC}{AE} \quad (\text{sides in proportion})$ $BC = \frac{120 \times 40}{36}$ $BC = 100 \text{ cm}$	✓ statement  ✓✓ substitution ✓ answer (4)  ✓ S  ✓ S  ✓ 90 ✓ answer (4)  ✓ S  ✓ S  ✓ substitution ✓ answer (4) <b>[6]</b>

## QUESTION 11



11.1	<p>Let <math>\hat{A}_1 = x</math>  In <math>\triangle ABC</math> and <math>\triangle ADT</math></p> <ol style="list-style-type: none"> <li> <math>\hat{A}_1 = \hat{B}_2 = x</math> (tan ch th)  <math>\hat{B}_2 = \hat{A}_3 = x</math> (<math>AC \parallel BD</math> alt <math>\angle</math>s)  <math>\hat{A}_1 = \hat{A}_3</math> </li> <li> <math>\hat{T}_3 = \hat{BCA}</math> (ext <math>\angle</math> cyclic quad) </li> <li> <math>\hat{B}_1 = \hat{D}_1</math> (<math>3^{\text{rd}}</math> <math>\angle</math> on triangle)  <math>\triangle ABC \parallel \triangle ADT</math> (<math>\angle\angle\angle</math>) </li> </ol>	<p>✓ statement  ✓ reason  ✓ statement</p> <p>✓ statement  ✓ reason</p> <p>✓ statement</p> <p>(6)</p>
11.2	<p><math>\hat{A}_1 = \hat{C}_2 = x</math> (tan ch th)  <math>\hat{T}_1 = \hat{C}_2 = x</math> (<math>AC \parallel BD</math>; alt <math>\angle</math>s)  <math>\therefore \hat{T}_1 = \hat{A}_1 = x</math>  <math>\hat{T}_4 = x</math> (vert opp angles)  <math>\hat{T}_4 = \hat{A}_1</math> (<math>= x</math>)  PT is a tangent (conv tan ch th)</p> <p><b>OR</b></p> <p><math>\hat{A}_1 = \hat{B}_2 = \hat{A}_3 = x</math> (<math>AC \parallel BT</math>)  <math>\hat{A}_3 = \hat{T}_1 = \hat{T}_4 = x</math> (<math>\angle</math>s in same segment)  <math>\hat{A}_1 = \hat{T}_4 = x</math>  PT is a tangent (conv tan ch th)</p> <p><b>OR</b></p> <p><math>\hat{B}_1 = \hat{T}_2</math> (<math>\angle</math>s in same seg)  <math>\hat{B}_1 = \hat{D}_1</math> (<math>\parallel \Delta</math>s)  <math>\hat{D}_1 = \hat{T}_2</math>  PT is a tangent (conv tan ch th)</p>	<p>✓ S/R  ✓ S/R</p> <p>✓ Reason</p> <p>(3)</p> <p>✓ S/R  ✓ S/R</p> <p>✓ Reason</p> <p>(3)</p> <p>✓ S/R  ✓ S/R</p> <p>✓ Reason</p> <p>(3)</p>
11.3	<p>In <math>\triangle APT</math> and <math>\triangle TPD</math></p> <ol style="list-style-type: none"> <li><math>\hat{P}</math> is common.</li> <li><math>\hat{T}_4 = \hat{A}_1</math> (proven)</li> <li><math>\hat{ATP} = \hat{D}_2</math> (<math>3^{\text{rd}}</math> <math>\angle</math> on triangle)</li> </ol> <p><math>\triangle APT \parallel \triangle TPD</math> (<math>\angle\angle\angle</math>)</p>	<p>✓ S/R  ✓ S/R</p> <p>✓ S</p> <p>(3)</p>

11.4	$\frac{AP}{PT} = \frac{PT}{PD} \quad (\triangle APT \parallel \triangle TPD)$ $AP \cdot PD = PT \cdot PT$ $AP \cdot \frac{1}{3} AP = PT^2$ $AP^2 = 3PT^2$	✓ statement ✓ reason  ✓ $DP = \frac{1}{3} AP$ ✓ substitution (4) <b>[16]</b>
------	---	--

**TOTAL: 150**